

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460



OFFICE OF PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

MEMORANDUM

Date: July 20, 2010

SUBJECT: Oxamyl: Updated Occupational and Residential Exposure Assessment

PC Code: 103801

Decision No.: NA

Petition No.: NA

Risk Assessment Type: Single Chemical

TXR No.: NA

MRID No.: 44686901, 44686902 and
44704801

DP Barcode: D378340

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Case No.: NA

CAS No.: 23135-22-0

40 CFR: NA

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The attached document is the Health Effects Division's (HED) updated occupational and residential exposure and risk (ORE) assessment for oxamyl. This assessment was completed to incorporate a change to the dermal endpoint based on an updated BMD analysis (D376936, TXR0055350). A previous ORE assessment was completed in response to the Section 3

registration request for sugar beet use and a number of requested label amendments (A. Nielsen, D365459 5/27/09), and that assessment also included evaluation of all currently labeled oxamyl use patterns. However, since that time, the registrant has withdrawn all new use requests.. Therefore this updated ORE assessment reflects the revised dermal endpoint as it applies to the current uses of oxamyl.



MEMORANDUM

Date: July 28, 2010

SUBJECT: Oxamyl: Updated Occupational and Residential Exposure Assessment

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BP Barcode: D378340

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7/28/10

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The attached document is the Health Effects Division's (HED) updated occupational and residential exposure and risk (ORE) assessment for oxamyl. This assessment was completed to incorporate a change in the dermal endpoint based on an updated RMD analysis (D376930, TXR002730). A previous ORE assessment was completed in response to the Section 3

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1.0 EXECUTIVE SUMMARY

This assessment was completed to incorporate a change to the dermal endpoint based on an updated BMD analysis (D376936, TXR0055350). A previous ORE assessment was completed in response to the Section 3 registration request for sugar beet use and as well as several label amendments including one for expanding use for dry bulb onion, garlic and shallot from regional to national use (A. Nielsen, D365459 5/27/09). The previous assessment also included evaluation of all currently labeled oxamyl use patterns and indicated that some revisions to labeled use patterns may be needed. Since the previous risk assessment was completed, the registrant has withdrawn all new use requests. Therefore this updated ORE assessment reflects the revised dermal endpoint as it applies to the current uses of oxamyl only and does not include any proposed new or expanded uses.

Oxamyl, [Methyl N', N'-dimethyl-N-[(methylcarbamoyl)oxy]-1-thio-oxamimidate], is an insecticide/nematicide that is formulated as a soluble concentrate liquid (24% and 42% active ingredient) and as a solid/technical (42% active ingredient). Oxamyl is applied with the following equipment: aerial equipment, chemigation, groundboom sprayer, airblast sprayer, spotgun (low-pressure handwand) applicator, handgun sprayer, and shank soil injection. Application rates for oxamyl range from 0.25 to 4 lb ai/acre. Oxamyl is a restricted use pesticide. At this time, products containing oxamyl are intended for occupational use only. HED has determined that there are potential exposures to mixers, loaders, applicators, and other handlers during usual use-patterns associated with oxamyl. Based on the use patterns, several major exposure scenarios were identified.

Since the toxicological effects are similar (cholinesterase inhibition in red blood cells) for the dermal and inhalation PoDs, the dermal and inhalation risks to handlers are combined for an aggregate occupational assessment. Since the level of concern is 100 for dermal risks and 30 for inhalation risks, an aggregated risk index (ARI) is calculated. The level of concern for an ARI is 1 (i.e., ARIs greater than 1 are not a concern). No chronic scenarios were identified. The short- and intermediate-term dermal risks are identical since the same PoD was chosen for short- and intermediate-term dermal assessments. The short- and intermediate-term inhalation risks are also identical since the same PoD was chosen for short- and intermediate-term inhalation assessments.

The short- and intermediate-term dermal risks did not exceed HED's level of concern at some level of risk mitigation for all handler scenarios, *except*:

- Mixing/loading liquid concentrates to support aerial applications to cotton in CA and AZ at 1.0 lb ai/A;
- Mixing/loading liquid concentrates to support chemigation applications at 2.0 lb ai/A;
- Applying sprays by aircraft to cotton in CA and AZ at 1.0 lb ai/A.

The short- and intermediate-term inhalation risks did not exceed HED's level of concern at the **baseline** level (no respirator) for all handler scenarios, *except* mixing/loading to support aerial applications to cotton in California and Arizona at the 1.0 lb ai/day application rate. Note that only the only data available for applying sprays with aircraft is for engineering controls (i.e., an enclosed cockpit) – the risks did not exceed HED's level of concern for aerial applicators at

baseline attire as long as enclosed cockpits are used.

The short- and intermediate-term combined dermal plus inhalation risks did not exceed HED's level of concern at some level of risk mitigation for all handler scenarios, *except*:

- Mixing/loading liquid concentrates to support aerial applications to cotton in CA and AZ at 1.0 lb ai/A;
- Mixing/loading liquid concentrates to support chemigation applications at 2.0 lb ai/A;
- Applying sprays by aircraft to cotton in CA and AZ at 1.0 lb ai/A.

HED has determined that there are potential exposures to occupational postapplication workers during usual use-patterns associated with oxamyl. Three dislodgeable foliar residue (DFR) studies were submitted in support of the reregistration of oxamyl. The DFR studies were done on three crops: cucumbers, tomatoes, and citrus fruits. To represent an arid and a non-arid climate, two sites were chosen for each crop -- one in California and another one in Florida or Georgia. A soil residue dissipation study also was conducted at the California site under tomato plants. The results of the postapplication risk assessment indicate that for many crops, risks remain a concern for several days following application.

This exposure/risk assessment relies in part on data from studies in which adult human subjects were intentionally exposed to a pesticide to determine their dermal and inhalation exposure. Many such studies, involving exposure to many different pesticides, comprise generic pesticide exposure databases such as the Pesticide Handlers Exposure Database (PHED), the Outdoor Residential Exposure Task Force (ORETF) Database and the Agricultural Reentry Task Force (ARTF) Database. EPA has reviewed all the studies in these multi-pesticide generic exposure databases, and on the basis of available evidence has found them to have been neither fundamentally unethical nor significantly deficient relative to standards of ethical research conduct prevailing when they were conducted. There is no regulatory barrier to continued reliance on these studies, and all applicable requirements of EPA's Rule for the Protection of Human Subjects of Research (40 CFR Part 26) have been satisfied.

2.0 HAZARD CHARACTERIZATION

2.1 Acute Toxicology Categories

Table 1 presents the acute toxicity categories as outlined in the *Oxamyl - Report of the Hazard Identification Assessment Review Committee*, dated August 31, 1999.

Table 1: Acute Toxicity Categories of Oxamyl	
Study Type	Toxicity Category (technical)
Acute Oral Toxicity	I
Acute Dermal Toxicity	IV
Acute Inhalation Toxicity	II
Primary Eye Irritation	III
Primary Dermal Irritation	IV
Dermal Sensitization	Not a skin sensitizer

2.2 Points of Departure

Dermal and inhalation points of departure (PoDs) have been identified for short-term (1 to 7 days) and intermediate-term (one week to several months) exposures (E. Reaves, D379814, 7/1/2010). These PoDs are listed in Table 2.

Table 2. Summary of Toxicological Dose and Points of Departure for Oxamyl for Use in Human Health Risk Assessment				
Exposure Scenario	Point of Departure (mg/kg/day)	Uncertainty/ FQPA Safety Factors	RfD, PAD, LOC for Risk Assessment	Study and Toxicological Effects
Acute Dietary <i>All populations</i>	0.069 mg/kg	UF _A =1x UF _H =10x FQPA SF=2.64x (brain)	aRfD=0.0069 aPAD= 0.0026 (½ -life 2.5 hours)	Human Study (MRID 44912301) BMD ₁₀ = 0.083 mg/kg BMDL ₁₀ = 0.069 mg/kg, based on RBC AChE inhibition
Chronic Dietary	Due to the rapid recovery of ChE activity, the acute exposure from oxamyl is the main duration of concern and therefore a chronic assessment is not appropriate for oxamyl.			
Incidental Oral (All durations)	Based on the current oxamyl uses, an incidental oral endpoint is not required.			
Dermal	8.0 mg/kg (RBC ChE)	UF _A =10x UF _H =10x FQPA SF=1x	MOE = 100 (adult)	21-day dermal rabbit study (40827601) RBC BMD ₁₀ is 23.1 mg/kg RBC BMDL ₁₀ is 8.0 mg/kg
Dermal Long-Term (>6 mos)	Due to the rapid recovery of ChE activity, the acute exposure from oxamyl is the main duration of concern and therefore a long-term assessment is not appropriate for oxamyl.			
Inhalation	RBC Occupational: HEC = 2.25 mg/m ³ or 0.39 mg/kg RBC Non-Occupational: HEC = 0.75 mg/m ³ or 0.13 mg/kg	UF _A =3x UF _H =10x FQPA SF= 1x	MOE = 30 (adult, occupational)	Acute inhalation rat (45155801) RBC BMD ₁₀ = 0.002 mg/L RBC BMDL ₁₀ = 0.0018 mg/L, based on RBC AChE inhibition in both sexes.
Inhalation Long-Term (>6 mos)	Due to the rapid recovery of ChE activity, the acute exposure from oxamyl is the main duration of concern and therefore a long-term assessment is not appropriate for oxamyl.			
Cancer (oral, dermal, inhalation)	Determined to be “not likely” a human carcinogen (Memorandum: HIARC report, Geruva Reddy, 8/31/1999)			

[†]**Explanation of Abbreviations:** UF = uncertainty factor. UF_A = extrapolation from animal to human (interspecies). UF_H = potential variation in sensitivity among members of the human population (intraspecies). FQPA SF = FQPA Safety Factor. aPAD = population adjusted dose. RfD = reference dose. MOE = margin of exposure. LOC = level of concern. N/A = not applicable. HEC = Human Equivalent Concentration. RDDR = regional deposited dose ratio.

Cancer Determination

Oxamyl was determined to be “not likely” a human carcinogen (Memorandum: HIARC report, Geruva Reddy, 8/31/1999).

FQPA Safety Factor

Since the time of the 1999 RED, the comparative cholinesterase study in which the sensitivity of the young to NMC's is best evaluated has become available. Similar to results in comparative cholinesterase studies with other *N*-methyl carbamates, this comparative cholinesterase study revealed that PND11 pups are more sensitive to oxamyl than adult rats. The FQPA factor is based on the ratio of the adult BMD₁₀ to PND11 BMD₁₀. Cholinesterase data from this one comparative cholinesterase study indicates that the PND11 pups were 2.64 fold more sensitive than adult rats to brain cholinesterase inhibition. The FQPA factor is not appropriate for pregnant females since the developmental studies did not indicate susceptibility. Therefore, for the single chemical risk assessment for oxamyl, the FQPA factor may be applied to the oral, dermal, and inhalation assessments for those scenarios involving children.

Levels of Concern

The levels of concern for occupational handlers and postapplication workers are 100 for dermal risk and 30 for inhalation risk.

Combined Risks

Since the toxicological effects are similar (cholinesterase inhibition in red blood cells) for the dermal and inhalation PoDs, the dermal and inhalation risks to handlers are combined for an aggregate occupational assessment. Since the level of concern is 100 for dermal risks and 30 for inhalation risks, an aggregated risk index (ARI) is calculated. The level of concern for an ARI is 1 (i.e., ARIs greater than 1 do not exceed HED's level of concern).

3.0 REGISTERED USE PATTERNS

3.1 Occupational-Use Products

Oxamyl [Methyl N', N'-dimethyl-N-[(methylcarbamoyl)oxy]-1-thio-oxamimidate] is an insecticide/nematicide/plant regulator that is registered for use on terrestrial food crops and terrestrial food and feed crops.

3.2 Type of Pesticide/Targeted Pest

Oxamyl is an insecticide, nematicide, and plant regulator.

3.3 Formulation Types and Percent Active Ingredient

Oxamyl is formulated as a soluble concentrate/liquid (24% and 42% active ingredient) and as a solid/technical (42% active ingredient).

3.4 Registered Use Sites

Table 3 lists the occupational use sites, the maximum application rates, and the application equipment for each of the registered uses of oxamyl. Current oxamyl labels state that oxamyl can only be used on commercial and farm plantings. Oxamyl is applied with the following equipment: aerial equipment, chemigation, groundboom sprayer, airblast sprayer, spotgun (low-pressure handwand) applicator, handgun sprayer, and shank soil injection. Application rates for oxamyl range from 0.25 to 4 lb ai/acre. Oxamyl can be applied anywhere from 1 to 12 times a year depending on the crop. Most crops have a maximum seasonal application rate of 6 times or less. Current end-use product labels limit aerial applications to a maximum of 1 pound active ingredient per acre and ground applications to foliage are limited to 2 pounds active ingredient per acre. Soil-directed applications are a maximum of 4 pounds active ingredient per acre. Maximum application rates vary by crop, by method of application, by target of application (soil versus foliage) and by state or region.

There are no registered uses of oxamyl at residential sites. Oxamyl is a restricted use pesticide. At this time, products containing oxamyl are intended for occupational use only. Current oxamyl labels state that oxamyl can only be used in commercial and farm plantings. Oxamyl is not for use in home plantings, nor on any commercial crop that is turned into a “u-pick” or “pick your own” or similar operation.

Table 3: Occupational Uses of Oxamyl				
Crop	Geographic Location	Target	Application Equipment	Maximum Application Rate (lb ai/A)
Apples	Entire U.S.	Foliage	airblast, handgun, chemigation	2
	WA	Foliage	aerial	1
	Thinning - NJ, PA, VA, WV	Foliage	airblast, handgun, chemigation	1
Bananas, Plantains	Puerto Rico	Foliage	low pressure handwand	0.005 lb ai/plant
		Soil	low pressure handwand	
Carrot	U.S., except CA	Foliage	groundboom, chemigation	1
		Soil	groundboom	4
			chemigation	2
Celery	AZ, CA	Foliage	aerial	0.5
		Foliage	groundboom, chemigation	0.5
	FL	Foliage	aerial	0.5
		Foliage	groundboom, chemigation	2
		Soil	groundboom	4
	PA, OH, MI, TX	Foliage	groundboom, chemigation	2
		Soil	groundboom	4
Citrus	Entire U.S.	Foliage	aerial, airblast, handgun	1
		Foliage	chemigation	2
		Soil		

Table 3: Occupational Uses of Oxamyl				
Crop	Geographic Location	Target	Application Equipment	Maximum Application Rate (lb ai/A)
Clover Grown for Seed	CA SLN (CA060028)	Foliage	Aerial, groundboom	1
Cotton	AZ and CA	Foliage	aerial, groundboom, chemigation,	1
	U.S., except AZ and CA	Foliage	aerial, groundboom, chemigation,	0.5
Cucurbits: Cucumber, Cantaloupe, Honeydew Melon, Watermelon, Squash, Pumpkin	West of Rockies	Foliage	groundboom, chemigation	1
	East of Rockies	Foliage	aerial, groundboom, chemigation	1
		Soil	groundboom	4
Eggplant	Entire U.S.	Foliage	groundboom, chemigation	1
	U.S., except CA	Soil	groundboom, chemigation	2
Garlic	OR, & NY SLN (NY990002)	Foliage	groundboom, chemigation	2
		Foliage	aerial	1
		Soil	groundboom	4
	CA (Modoc & Siskiyou counties)	Foliage	aerial, groundboom, chemigation	1
	WA SLN (WA000018)	Foliage & Soil	groundboom, chemigation	1
	CA	Foliage	groundboom, chemigation	2
		Soil		
Ginger Root	HI	Foliage	groundboom	1
		Soil	groundboom	4
Nonbearing Fruit (apple, cherry, citrus, peach, pear)	Entire U.S.	Foliage	aerial, groundboom, airblast, handgun, chemigation	1
		Soil	groundboom, airblast, handgun	4
Onions (dry bulb only)	OR, ID, WA, & NY SLN (NY990002)	Foliage	aerial	1
		Foliage	groundboom, chemigation	2
		Soil	groundboom	4
	CA	Soil	groundboom	2
		Foliage	groundboom, chemigation	2
	CA (Modoc & Siskiyou counties) & CO SLN (CO010005) & NV SLN (NY990002) & UT SLN (UT990004)	Foliage	aerial, groundboom, chemigation	1
	MI, TX	Foliage	aerial	0.5
		Foliage	groundboom, chemigation	2
		Soil	groundboom	4
	WI SLN (WI070005)	Foliage	aerial, groundboom	0.5
		Soil	Groundboom	4
	NM	Foliage	aerial, groundboom, chemigation	0.5
Peanuts	U.S., except CA	Foliage	aerial, groundboom, chemigation	0.5
		Soil	aerial, groundboom, chemigation	0.5
Pears	U.S., except CA	Foliage	airblast, handgun, chemigation	2

Table 3: Occupational Uses of Oxamyl				
Crop	Geographic Location	Target	Application Equipment	Maximum Application Rate (lb ai/A)
Peppermint and Spearmint	ID, MI, MT, OR, WA, WI	Foliage	groundboom, chemigation	2
			aerial	1
Peppers (Bell and Non-Bell)	Entire U.S.	Foliage	aerial, groundboom, chemigation	1
		Soil	groundboom, chemigation	1
Pineapple	U.S., except CA	Foliage	groundboom, chemigation	2
		Soil	groundboom, chemigation	2
Potatoes	Entire U.S.	Foliage	aerial, groundboom, chemigation	1
	MD SLN (MD080003) & NY SLN (NY080001)	Foliage & Soil	groundboom, chemigation	2
	PA SLN (PA070002)	Foliage	groundboom, chemigation	1
		Soil	groundboom	2
	U.S., except Northeast, Mid-Atlantic States	Soil	groundboom	4
Sweet Potatoes	U.S., except CA	Soil	groundboom	4
Tobacco	Entire U.S.	Soil	groundboom, chemigation	2
Tomatoes	Entire U.S.	Foliage	aerial, groundboom, chemigation	1
		Soil	chemigation	2
	CA only	Soil	groundboom	1.25
Yams	Puerto Rico	Soil	groundboom, chemigation	0.5

4.0 OCCUPATIONAL EXPOSURE/RISK PATHWAY

4.1 Occupational Handler Exposures

HED has determined that there are potential exposures to mixers, loaders, applicators, and other handlers during usual use patterns associated with oxamyl. Based on the use patterns of oxamyl, several major exposure scenarios were identified for oxamyl:

- mixing/loading liquids for aerial application;
- mixing/loading liquids for chemigation application;
- mixing/loading liquids for groundboom application;
- mixing/loading liquids for airblast application;
- applying liquids with aerial equipment;
- applying liquids with a groundboom sprayer;
- applying liquids with an airblast sprayer;
- flagging for liquid aerial applications;
- mixing/loading/applying with spotgun (low-pressure handwand) equipment; and
- mixing/loading/applying with handgun equipment.

4.1.1 Occupational Handler Assumptions

Chemical-specific data for assessing human exposures during pesticide handling activities were not submitted to the Agency in support of the reregistration of oxamyl. It is the policy of the HED to use data from the Pesticide Handlers Exposure Database (PHED) Version 1.1 and data from the Outdoor Residential Exposure Task Force (ORETF) to assess handler exposures for regulatory actions when chemical-specific monitoring data are not available.

PHED: The PHED Task Force is comprised of representatives from the U.S. EPA, Health Canada, the California Department of Pesticide regulation, and member companies of the American Crop Protection Association. PHED is a software system consisting of two parts: a database of measured exposure values for workers involved in the handling of pesticides under actual field conditions and a set of computer algorithms used to subset and statistically summarize the selected data. Currently, the database contains values for over 1,700 monitored individuals (i.e., replicates).

Users select criteria to subset the PHED database to reflect the exposure scenario being evaluated. The subsetting algorithms in PHED are based on the central assumption that the magnitude of handler exposures to pesticides are primarily a function of activity (e.g., mixing/loading, applying), formulation type (e.g., wettable powders, granulars), application method (e.g., aerial, groundboom), and clothing scenarios (e.g., gloves, double layer clothing).

Once the data for a given exposure scenario have been selected, the data are normalized (i.e., divided by) by the amount of pesticide handled resulting in standard unit exposures (milligrams of exposure per pound of active ingredient handled). Following normalization, the data are statistically summarized. The distribution of exposure values for each body part (e.g., chest upper arm) is categorized as normal, lognormal, or “other” (i.e., neither normal nor

lognormal). A central tendency value is then selected from the distribution of the exposure values for each body part. These values are the arithmetic mean for normal distributions, the geometric mean for lognormal distributions, and the median for all “other” distributions. Once selected, the central tendency values for each body part are composited into a “best fit” exposure value representing the entire body.

The unit exposure values calculated by PHED generally range from the geometric mean to the median of the selected data set. While data from PHED provide the best available information on handler exposures, it should be noted that some aspects of the included studies (e.g., duration, acres treated, pounds of active ingredient handled) may not accurately represent labeled uses in all cases. HED has developed a series of tables of standard unit exposure values for many occupational scenarios that can be utilized to ensure consistency in exposure assessments (PHED Surrogate Exposure Guide, August 1998).

ORETF Handler Studies (MRID 44972201): A report was submitted by the ORETF (Outdoor Residential Exposure Task Force) that presented data in which the application of various products used on turf by homeowners and lawncare operators (LCOs) was monitored. All of the data submitted in this report were completed in a series of studies.

OMA002: LCO Liquid Applications with a Low Pressure Handgun (MRID 44972201): A mixer/loader/applicator study was performed by the Outdoor Residential Exposure Task Force (ORETF) using Dacthal as a surrogate compound to determine “generic” exposures to individuals applying a pesticide to turf with a low-pressure “nozzle gun” or “handgun” sprayer. Dermal and inhalation exposures were estimated using whole-body passive dosimeters and breathing-zone air samples on OVS tubes. Inhalation exposure was calculated using an assumed respiratory rate of 17 liters per minute for light work (NAFTA, 1999), the actual sampling time for each individual, and the pump flow rate. All results were normalized for pounds active ingredient handled.

A total of 90 replicates were monitored using 17 different subjects. Four different formulations of dacthal [75% wettable powder (packaged in 4 and 24 pound bags), 75% wettable powder in water soluble bags (3 pound bag), 75% water dispersible granules (2 pound bag) and 55% liquid flowable (2.5 gallon container)] were applied by five different LCOs to actual residential lawns at each site in three different locations (Ohio, Maryland, and Georgia) for a total of fifteen replicates per formulation. An additional ten replicates at each site were monitored while they performed spray application only using the 75 percent wettable powder formulation. A target application rate of 2 pounds active ingredient was used for all replicates (actual rate achieved was about 2.2 pounds active ingredient per acre). Each replicate treated a varying number of actual client lawns to attain a representative target of 2.5 acres (1 hectare) of turf. The exposure periods averaged five hours twenty-one minutes, five hours thirty-nine minutes, and six hours twenty-four minutes, in Ohio, Maryland and Georgia, respectively. Average time spent spraying at all sites was about two hours. All mixing, loading, application, adjusting, calibrating, and spill clean up procedures were monitored, except for typical end-of-day clean-up activities, e.g. rinsing of spray tank, etc. Dermal exposure was measured using inner and outer whole body dosimeters, hand washes, face/neck washes, and personal air monitoring devices. All test subjects wore one-piece, 100 percent cotton inner dosimeters

beneath 100 percent cotton long-sleeved shirt and long pants, rubber boots and nitrile gloves. Gloves are typically worn by most LCOs, and required by many pesticide labels for mixing and loading.

Overall, residues were highest on the upper and lower leg portions of the dosimeters. In general, concurrent lab spikes produced mean recoveries in the range of 78-120 percent, with the exception of OVS sorbent tube sections which produced mean recoveries as low as 65.8 percent. Adjustment for recoveries from field fortifications were performed on each dosimeter section or sample matrix for each study participant, using the mean recovery for the closest field spike level for each matrix and correcting the value to 100 percent. The unit exposure values are presented below in Table 4. [Note the data were found to be lognormally distributed. As a result, all exposure values are geometric means.]

Table 4: Unit Exposure Values Obtained for LCO Liquid Applications with a Low Pressure Handgun from ORETF Handgun Studies (MRID 44972201)				
Application Method⁴	Total Dermal Unit Exposure¹ (mg/lb ai)			Inhalation Unit Exposure^{1,2} (µg/lb ai)
	Single Layer, No Gloves	Single Layer, Gloves	Double Layer³, Gloves	
LCO Handgun Spray Mixer/Loader/Applicator Liquid Flowable	No Data	0.45	0.245	1.8

¹ Unit exposure values reported are geometric means.

² Air concentration (mg/m³/lb ai) calculated using NAFTA '99 standard breathing rate of 17 lpm (1 m³/hr).

³ Exposure calculated using OPP/HED 50% protection factor (PF) for cotton coveralls on torso, arms, and legs.

⁴ All commercial handlers wore long pants, long-sleeved shirt, nitrile gloves and shoes.

ORETF Handler Studies (MRID 44459801): A report was submitted by the ORETF (Outdoor Residential Exposure Task Force) that presented data in which the application of various products used on vegetable gardens by homeowners was monitored. All of the data submitted in this report were completed in a series of studies.

OMA006: Homeowner Liquid Application to Garden with a Low Pressure Handwand (MRID 44459801): The study was designed to quantify dermal and inhalation exposure of homeowners as they mixed, loaded and applied liquid formulations of a carbaryl end-use product to home garden vegetables. A low pressure handwand) was used to apply Sevin Liquid® Brand Carbaryl Insecticide. Twenty replicates were conducted with gloves and 20 replicates were conducted without gloves. Inhalation exposure was monitored using personal air samplers (average flow rate of 1.5 liter/minute) and dermal exposure was monitored by using inner and outer dosimeters, facial/neck wipes, and hand washes. The overall mean field fortification recovery of each matrix ranged from 77.6 ± 13.6% (outer dosimeters) to 98.4 ± 3.8% (OVS tubes). Laboratory fortified recovery samples were analyzed with each set of samples analyzed on a particular day; however, the results of the laboratory recoveries were not provided in the Study Report. Unit exposures were calculated for short pants/short sleeves, long pants/short sleeves, and long pants/long sleeves scenarios. The results for the low pressure handwand are summarized in Table 5 below.

Table 5. Unit Exposure Values for Homeowner Liquid Application to Garden with a Low Pressure Handwand Obtained From ORETF Study (MRID 44459801)			
Scenario Monitored	Total Dermal Unit Exposure¹ (mg/lb ai)		Inhalation Unit Exposure¹ (µg/lb ai)
	Gloves	No Gloves	No Respirator
Homeowner Liquid Applications with a Low Pressure Handwand Sprayer	0.33	15	2.7

¹ Unit exposure values reported are geometric means.

The following general assumptions are made:

- Average body weight of an adult handler is 70 kg.
- Average work day interval is 8 hours which represents a typical day.
- Calculations of handler scenarios are completed using the maximum application rates on the oxamyl labels.
- PHED Version 1.1 or ORETF surrogate data were used for to estimate exposures for all scenarios. NOTE: According to information provided by DuPont, the Vydate L spotgun applicator appears to have a similar application technique as a low pressure handwand and therefore exposure from the spotgun is assumed to be similar to the low pressure handwand. Thus, PHED and ORETF unit exposure data from the use of a low pressure handwand was used as surrogate data for the spotgun applicator.
- Due to a lack of scenario-specific data, HED calculated unit exposure values using generic data from the Pesticide Handler Exposure Database (PHED) and the Outdoor Residential Exposure Task Force database (ORETF). When necessary, protection factors are applied to represent various risk mitigation options (i.e., the use of respirator and double-layer body protection).
- Exposures were estimated for handlers using:
 - 1200 acres per day for aerial applications to cotton,
 - 350 acres per day for aerial applications to all other crops,
 - 350 acres per day for chemigation applications,
 - 200 acres per day for groundboom applications to cotton,
 - 80 acres per day for groundboom applications to all other crops,
 - 40 acres per day for airblast applications to tree crops,
 - 5 acres per day for handgun applications to tree crops, and
 - 2 acres per day for a spotgun (low-pressure handwand applications to bananas and plantains. Note: According to information provided by DuPont, there are approximately 715 banana plants per acre and a person can apply oxamyl with a

spotgun to approximately 2 acres per day. Since 10 mL of concentrate is applied per plant, then 3.6 pounds active ingredient is applied per acre.

- There are no data to assess handler exposure during a shank injection application. However, exposure to handlers during groundboom application is considered to be a reasonable surrogate.

4.1.2 Occupational Handler Equations

Potential daily dermal exposure is calculated using the following formula:

$$\text{Daily Dermal Exposure} \left(\frac{\text{mg ai}}{\text{day}} \right) = \text{Unit Exposure} \left(\frac{\text{mg ai}}{\text{lb ai}} \right) \times \text{Use Rate} \left(\frac{\text{lb ai}}{\text{A}} \right) \times \text{Daily Acres Treated} \left(\frac{\text{A}}{\text{day}} \right)$$

Potential daily inhalation exposure is calculated using the following formula:

$$\begin{aligned} \text{Daily Inhalation Exposure} \left(\frac{\text{mg ai}}{\text{day}} \right) = \\ \text{Unit Exposure} \left(\frac{\mu\text{g ai}}{\text{lb ai}} \right) \times \text{Conversion Factor} \left(\frac{1\text{mg}}{1,000 \mu\text{g}} \right) \times \text{Use Rate} \left(\frac{\text{lb ai}}{\text{A}} \right) \times \text{Daily Acres Treated} \left(\frac{\text{A}}{\text{day}} \right) \end{aligned}$$

The daily dermal and inhalation dose is calculated using a 70 kg body weight for both short-term and intermediate-term exposure as follows:

$$\text{Daily Dermal Dose} \left(\frac{\text{mg ai}}{\text{Kg/Day}} \right) = \text{Daily Dermal Exposure} \left(\frac{\text{mg ai}}{\text{Day}} \right) \times \left(\frac{1}{\text{Body Weight (Kg)}} \right)$$

$$\text{Daily Inhalation Dose} \left(\frac{\text{mg ai}}{\text{kg/day}} \right) = \text{Daily Inhalation Exposure} \left(\frac{\text{mg ai}}{\text{day}} \right) \times \left(\frac{1}{\text{Body Weight (kg)}} \right)$$

The short-term and intermediate-term risks for dermal exposure were calculated using a NOAEL of 8 mg/kg/day. The short-term and intermediate-term risks for inhalation exposure were calculated using a NOAEL of 0.39 mg/kg/day. The inhalation and dermal MOEs were calculated using the following formulas:

$$\text{Dermal MOE} = \frac{\text{NOAEL} \left(\frac{\text{mg}}{\text{kg/day}} \right)}{\text{Dermal Daily Dose} \left(\frac{\text{mg}}{\text{kg/day}} \right)}$$

$$\text{Inhalation MOE} = \frac{\text{NOAEL} \left(\frac{\text{mg}}{\text{kg/day}} \right)}{\text{Inhalation Daily Dose} \left(\frac{\text{mg}}{\text{kg/day}} \right)}$$

Since the toxicological effects are similar (cholinesterase inhibition in red blood cells) for the dermal and inhalation PoDs, the dermal and inhalation risks to handlers are combined. Since the level of concern is 100 for dermal risks and 30 for inhalation risks, an aggregated risk index (ARI) is calculated. The level of concern for an ARI is 1 (i.e., ARIs greater than 1 are not a concern). ARIs are calculated using the following formula:

$$\text{Aggregated Risk Index (ARI)} = 1 / (1/(\text{Dermal MOE} / 100) + 1/(\text{Inhalation MOE} / 30)).$$

4.1.3 Summary of Risk Concerns for Occupational Handlers

The short- and intermediate-term dermal risks are identical since the same PoD was chosen for short- and intermediate-term dermal assessments. The short- and intermediate-term inhalation risks are also identical since the same PoD was chosen for short- and intermediate-term inhalation assessments. A summary of the short-term and intermediate-term risks are presented in Table 6 (see Appendices A-C for more detail regarding risk calculations). Since the toxicological effects are similar (cholinesterase inhibition in red blood cells) for the dermal and inhalation PoDs, the dermal and inhalation risks to handlers are combined for an aggregate occupational assessment. Since the level of concern is 100 for dermal risks and 30 for inhalation risks, an aggregated risk index (ARI) is calculated. The level of concern for an ARI is 1 (i.e., ARIs greater than 1 are not a concern).

4.1.3.1 Occupational Dermal Risks

The short- and intermediate-term dermal risks did not exceed HED's level of concern at some level of risk mitigation for all handler scenarios, *except*:

- Mixing/loading liquid concentrates to support aerial applications to cotton in CA and AZ at 1.0 lb ai/A;
- Mixing/loading liquid concentrates to support chemigation applications at 2.0 lb ai/A;
- Applying sprays by aircraft to cotton in CA and AZ at 1.0 lb ai/A.

4.1.3.2 Occupational Inhalation Risks

The short- and intermediate-term inhalation risks did not exceed HED's level of concern at the **baseline** level (no respirator) for all handler scenarios, *except* mixing/loading to support aerial applications to cotton in California and Arizona at the 1.0 lb ai/day application rate. Note that only the only data available for applying sprays with aircraft is for engineering controls (i.e., an enclosed cockpit) – the risks did not exceed HED's level of concern for aerial applicators at baseline attire as long as enclosed cockpits are used.

4.1.3.3 Occupational Combined Risks

The short- and intermediate-term combined dermal plus inhalation risks did not exceed HED's level of concern at some level of risk mitigation for all handler scenarios, *except*:

- Mixing/loading liquid concentrates to support aerial applications to cotton in CA and AZ at 1.0 lb ai/A;
- Mixing/loading liquid concentrates to support chemigation applications at 2.0 lb ai/A;
- Applying sprays by aircraft to cotton in CA and AZ at 1.0 lb ai/A.

Table 6: Summary of Risk Mitigation for Handlers Exposed to Oxamyl

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Handler Risk Mitigation
Mixer/Loader				
Mixing/Loading Liquid Concentrates for Aerial Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA), Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	Engineering Controls (ARI = 1.8)
	Cotton (CA and AZ)	1	1200	Risks of concern with maximum risk mitigation – closed system mixing/loading (ARI = 0.51)
	Cotton (not AZ and CA)	0.5	1200	Engineering Controls (ARI = 1.0)
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	Baseline plus C-R gloves (ARI = 1.1)
Mixing/Loading Liquid Concentrates for Chemigation Applications (PHED)	Apples; Carrot (not CA); Celery (FL, PA, OH, MI, TX); Citrus; Eggplant (not CA); Garlic (CA, OR); Dry Bulb Onions (CA, OR, ID, WA, MI, TX); Pears (not CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Pineapple (not CA); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco; Tomatoes	2	350	Risks of concern with maximum risk mitigation – closed mixing/loading system (ARI = 0.88)
Mixing/Loading Liquid Concentrates for Chemigation Applications (PHED)	Apples for Thinning (NJ, PA, VA, WV); Cotton (CA and AZ); Cucurbits; Dry Bulb Onions (SLN CO, SLN NV, SLN UT); Eggplant (CA); Garlic (SLNWA); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Peppers; Potatoes	1	350	Engineering Controls (ARI = 1.8)
	Celery (AZ, CA); Cotton (not CA and AZ); Dry Bulb Onions (NM); Peanuts (not CA); Yams (Puerto Rico only)	0.5	350	Baseline plus C-R gloves (ARI = 1.1)

Table 6: Summary of Risk Mitigation for Handlers Exposed to Oxamyl

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Handler Risk Mitigation
Mixing/Loading Liquids Concentrates for Groundboom Applications (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear; soil); Carrots (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Roots (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	Engineering Controls (ARI = 1.9)
	Pineapples (not CA); Eggplants (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	Baseline plus C-R gloves (ARI = 1.2)
	Tomatoes (CA)	1.25	80	Baseline plus C-R gloves (ARI = 1.8)
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (SLN CO, SLN NV, SLN UT); Eggplants (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes (entire US)	1	80	Baseline plus C-R gloves (ARI = 2.3)
Mixing/Loading Liquids Concentrates for Groundboom Applications (PHED) cont	Cotton (AZ and CA)	1	200	Double layers plus C-R gloves (ARI = 1.1)
	Cotton (U.S. except CA and AZ)	0.5	200	Baseline plus C-R gloves (ARI = 1.8)
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	Baseline plus C-R gloves (ARI = 4.6)
Mixing/Loading Liquids Concentrates for Airblast Applications (PHED)	Apples; Pears (not CA)	2	40	Baseline plus C-R gloves (ARI = 2.3)
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	Baseline plus C-R gloves (ARI = 4.6)
Applicator				
Applying Sprays via Aerial Equipment (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies); Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	Enclosed cockpits (ARI = 3.0)
	Cotton (CA and AZ)	1	1,200	Risks of concern with maximum risk mitigation – enclosed cockpits (ARI = 0.86)

Table 6: Summary of Risk Mitigation for Handlers Exposed to Oxamyl

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Handler Risk Mitigation
Applying Sprays via Aerial Equipment (PHED)	Cotton (not AZ and CA)	0.5	1,200	Enclosed cockpits (ARI = 1.7)
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	Enclosed cockpits (ARI = 5.9)
Applying Sprays via Groundboom Equipment (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear); Carrot (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Root (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	Double layers plus C-R gloves (ARI = 1.1)
	Pineapple (not CA); Eggplant (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	Baseline attire (ARI = 1.9)
	Tomatoes (CA)	1.25	80	Baseline attire (ARI = 3.0)
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (SLN CO, SLN NV, SLN UT); Eggplant (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes (entire US)	1	80	Baseline attire (ARI = 3.8)
	Cotton (AZ and CA)	1	200	Baseline attire (ARI = 1.5)
	Cotton (U.S. except CA and AZ)	0.5	200	Baseline attire (ARI = 3.0)
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	Baseline attire (ARI = 7.5)
Applying Sprays via Airblast Equipment PHED)	Apples; Pears (not CA)	2	40	Engineering control dermal (enclosed cab) plus baseline inhalation (no respirator) (ARI = 1.5)
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	Engineering control dermal (enclosed cab) plus baseline inhalation (no respirator) (ARI = 3.0)

Table 6: Summary of Risk Mitigation for Handlers Exposed to Oxamyl

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Handler Risk Mitigation
Flagger				
Flagging for Aerial Sprays Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	Baseline (ARI = 1.2)
	Cotton (CA and AZ)	1	350	Baseline (ARI = 1.2)
	Cotton (U.S. except AZ and CA)	0.5	350	Baseline (ARI = 2.4)
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	Baseline (ARI = 2.4)
Mixer/Loader/Applicator				
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (PHED)	Bananas, Plantains (PR)	3.6	2	Baseline plus C-R gloves (ARI = 1.3)
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (ORETF, ground directed)	Bananas, Plantains (PR)	3.6	2	Baseline plus C-R gloves (ARI = 2.3)
Mixing/Loading/Applying Liquid Concentrates with a Handgun Sprayer (LCO ORETF data)	Nonbearing Fruit (apple, cherry, citrus, peach, pear)	4	5	Double layers plus C-R gloves (ARI = 1.1)
	Apples; Pears (not CA)	2	5	Baseline plus C-R gloves (ARI = 1.2)
	Apples for Thinning (NJ, PA, VA, WV); Citrus	1	5	Baseline plus C-R gloves (ARI = 2.4)

Footnotes

- a. Application rates are maximum application rates from the labels.
- b. Science Advisory Council Policy # 9.1
- c. Risk Mitigation: Baseline = long-sleeved shirt, long pants, shoes, and socks; C-R gloves = chemical-resistant gloves; Double layers = coveralls over long-sleeved shirt, long pants; Engineering control for mixing/loading = closed system; Engineering control for aerial applicators = enclosed cockpit; and Engineering control for airblast applicator = enclosed cab.

4.2 Occupational Postapplication Exposures

4.2.1 Occupational Dermal Postapplication Exposures

4.2.1.1 Occupational Dermal Postapplication Assumptions and Calculations

The registrant has submitted three dislodgeable foliar residue (DFR) studies in support of the reregistration of oxamyl:

- “Dissipation of Dislodgeable Foliar and Soil Residues of Oxamyl Following Application of Vydate® L Insecticide to Tomatoes in the USA- Season 1997 and 1998;” MRID 44704801.
- “Dissipation of Dislodgeable Foliar Residues of Oxamyl from Citrus Following Application of Vydate® L Insecticide in the U.S.A - Season 1997;” MRID 44686901.
- “Dissipation of Dislodgeable Foliar Residues of Oxamyl from Cucumbers Following Application of Vydate® L Insecticide in the U.S.A. - Season 1997;” MRID 44686902.

The dissipation data obtained from these studies has been used to determine the days after treatment when the calculated MOE did not exceed HED’s level of concern ($MOE \geq 100$) for oxamyl crops following foliar applications of oxamyl. The raw data from the studies are corrected for recoveries as appropriate. The data is then natural log transformed. A semi-log regression analysis is run on the log transformed data. From the regression analysis, a dissipation rate (slope) and predicted dislodgeable foliar residue data for each site and crop is determined. If the day 0 actual DFR data are significantly higher than the predicted DFR, then the actual data are used for day 0 calculations. The following calculations are used to calculate the dose and risk. The Restricted Entry Interval (REI) typically is established on the day that the calculated MOE is 100 or above.

Daily dose is calculated as follows:

$$Dose (mg/kg/d) = \frac{(DFR (\mu g/cm^2) \times Tc (cm^2/hr) \times CF \left(\frac{1 mg}{1,000 \mu g} \right) \times ED (hrs)}{BW (kg)}$$

Where:

DFR	= Dislodgeable Foliar Residue initial or daily ($\mu g/cm^2$) at time (t).
Tc	= Transfer coefficient (cm^2/hr)
CF	= Conversion factor (1 mg/1,000 μg)
ED	= Exposure duration (hours per day)
BW	= Body weight (kg)

The daily MOE is calculated as follows:

$$MOE = \frac{NOAEL(mg/kg/day)}{Dose(mg/kg/day)}$$

Where:

NOAEL = 8 mg/kg/day

Dose = Calculated dose

The following general assumptions are made:

- Only crops where oxamyl is applied to the foliage are included in this assessment. There are no soil transfer values or other data available to evaluate postapplication exposure and risk following oxamyl applications to the soil. However, the exposure is likely to be minimal and the default REI for oxamyl should be sufficiently protective for postapplication workers exposed to oxamyl in the soil.
- The transfer coefficients used in this assessment are from the Agricultural Reentry Task Force (ARTF) database. An interim transfer coefficient policy was developed by HED's Science Advisory Council for Exposure using the ARTF database (policy # 3.1). It is the intention of HED's Science Advisory Council for Exposure that this policy will be periodically updated to incorporate additional information about agricultural practices in crops and new data on transfer coefficients.
- A route-specific dermal study was used to select a dermal PoD, so a dermal absorption value is not necessary.
- The exposure duration is assumed to be 8 hour work day.
- Adult body weight is 70 kg.

Table 7 is a summary of the DFR studies' parameters. A detailed summary of each DFR is below.

Table 7. Comparison of Dislodgeable Foliar Residue Study Parameters						
Crop	Tomatoes		Citrus		Cucumbers	
Site	Florida	California	Florida	California	Georgia	California
Slope	-0.43	-0.12	-0.235	-0.078	-0.51	-0.282
Initial Residues ($\mu\text{g}/\text{cm}^2$)	1.85	3.83 (actual)	2.14 (actual)	2.05 (actual)	4.1 (actual)	3.9 (actual)
Study Application Rate (lb ai/A)	1		1		1	
Half Life (days)	1.6	5.8	3.0	8.9	1.4	2.5
R² Values	0.99	0.67	0.86	0.76	0.81	0.94

Cucumber DFR Study - MRID 44686902: The study: "Dissipation of Dislodgeable Foliar Residues of Oxamyl from Cucumbers Following Application of Vydate® L Insecticide in the U.S.A. - Season 1997;" (MRID 44686902), was submitted by the registrant and reviewed by HED. The study was conducted at two sites, one in California and one in Georgia, during the summer of 1997. The treated plot at each site received two applications of Vydate® L insecticide/ nematicide using a tractor-mounted boom sprayer. There was a fourteen-day interval between the applications. The application rate for each treatment was 1 pound of active ingredient (ai) per acre applied at a rate of 50 gallons per acre of finished spray at both sites. The data from leaf punches after the second treatment were used to characterize concentration of oxamyl on the treated crop and the rate of dissipation.

The subplots at the California site were furrow /flood irrigated, while the subplots at the Georgia site did not require irrigation. The rainfall for the month of July was 10.64 inches at the Georgia site. This exceeded the 10-year average for July at the Georgia site of 6.58 inches. However, the total average rainfall during the course of the study at the Georgia site was 12.55 inches. This was lower than the 10-year total average for the same stretch of time, which was 14.97 inches. The first rainfall after the last application at the Georgia site occurred on Day 4. At the California site, there was no rain during the course of the study and the irrigation water did not wet the sampled foliage.

Foliage leaf punch samples were collected randomly from dry viable leaves from each subplot and control plot using a one inch diameter Birkestrand® leaf punch sampler. One control sample from the control plot and three replicate samples from the treated plot were collected at both study sites at the following sampling intervals: prior to each application, immediately after each application after the spray dried (day 0), and 1, 2, 3, 7, 14, 21, 28, and 35 days after the second (final) application. The California site experienced an insect infestation after the 28th day, leaving no viable leaves to be sampled on the 35th day.

For the Georgia and California sites, on day 0 the actual DFR data are higher than the predicted DFR data. Since using the predicted values for day 0 would underestimate exposure,

the actual values are also reported for day 0 for this site. Results from the regression analysis are presented in Table 8 of this report.

Table 8. Cucumber Foliar Dissipation for Oxamyl (MRID 44686902)										
Site	DFR ($\mu\text{g}/\text{cm}^2$) Predicted Values–Based on Log Transformed Data (Values in Parentheses are Actual Field Measured Averages)									
	0 DAT	1 DAT	2 DAT	3 DAT	4 DAT	5 DAT	6 DAT	7 DAT	R ²	Slope ($t_{1/2}$ days) ^a
Georgia	1 (4.1)	0.6 (0.87)	0.36	0.22	0.13	0.079	0.048	0.029	0.81	-0.508 (1.36)
California	3.2 (3.9)	2.4 (3.4)	1.8 (2.8)	1.4	1.03	0.78	0.59	0.44	0.94	-0.282 (2.46)

a $t_{1/2}$ is the calculated half-life of oxamyl at the Georgia site are from 0 DAT to 14 DAT and the half-life of oxamyl at the California site are from 0 DAT to 28 DAT.

Tomato DFR Study - MRID 44704801: The study: “*Dissipation of Dislodgeable Foliar and Soil Residues of Oxamyl Following Application of Vydate® L Insecticide to Tomatoes in the USA- Season 1997 and 1998.*” (MRID 44704801) was submitted by the registrant and reviewed by HED. There were two sites in the study, one in California and one in Florida. Two applications of Vydate® L were applied 5 days apart to test fields. For the California site, the applications were made beginning in mid July 1997 and for the Florida site, the applications were made in mid November 1997. Vydate® L was applied twice at each site using a broadcast boom sprayer at an application rate of 1.0 lb ai per acre in 50 gallons per acre of final volume. The data from leaf punches after the second treatment were used to characterize concentration of oxamyl on the treated crop and the rate of dissipation. Numerous rainfall events occurred during the study at the Florida site. During the study from Nov. 13, 1997 - Dec. 23, 1997, 14.40 inches of precipitation fell at the Florida site, while the 10-year average precipitation amounts were 2.36 inches in Nov. and 2.82 inches in December. The first rainfall after the last application at the Florida site occurred on Day 16. Only one rain event occurred at the California site - 0.05 inches on Day 2 after the last application.

The average foliar residues immediately after the second (last) application were 2.03 $\mu\text{g}/\text{cm}^2$ at the Florida site and 3.83 $\mu\text{g}/\text{cm}^2$ at the California site. After 14 days, the residues declined to 0.005 $\mu\text{g}/\text{cm}^2$ at the Florida site and 0.065 $\mu\text{g}/\text{cm}^2$ at the California site. At the Florida site, the DFR residues were less than the limit of quantitation (LOQ) of 0.001 $\mu\text{g}/\text{cm}^2$ after Day 14; therefore, data on Day 21, 28, and 35 were removed from regression analysis for this site. Results from the regression analysis are presented in Table 9 of this report.

Table 9. Tomato Foliar Dissipation for Oxamyl (MRID 44704801)										
Site	DFR ($\mu\text{g}/\text{cm}^2$) Predicted Values – Based on Log Transformed Data (Values in Parentheses are Actual Field Measured Averages)									
	0 DAT	1 DAT	2 DAT	3 DAT	4 DAT	5 DAT	6 DAT	7 DAT	R ²	Slope ($t_{1/2}$ days) ^a
Florida	1.85	1.21	0.79	0.51	0.34	0.22	0.14	0.094	0.99	-0.425 (1.62)
California (foliar)	0.61 (3.83)	0.54 (1.29)	0.48	0.43	0.38	0.34	0.30	0.27	0.24	-0.119 (5.84)

a $t_{1/2}$ is the calculated half-life of oxamyl at the Florida site are from 0 DAT to 14 DAT and the half-life of Oxamyl at the California site are from 0 DAT to 35 DAT.

Citrus DFR Study - MRID 44686901: The study: “*Dissipation of Dislodgeable Foliar Residues of Oxamyl from Citrus Following Application of Vydate® L Insecticide in the U.S.A - Season 1997*” (MRID 44686901) was submitted by the registrant and review by HED. The study was done at two sites, one in Florida and one in California. The treated plots at each site received two applications of Vydate® L insecticide using airblast sprayer applications of the test substance. At the California site, each application was 1.0 pounds of active ingredient per acre in 100 gallons of finished spray per acre. The data from leaf punches after the second treatment were used to characterize concentration of oxamyl on the treated crop and the rate of dissipation. A protocol deviation occurred when for the first application in Florida; Vydate®L was sprayed 1.25 lb ai/acre due to an increase in spray pressure from 60 to 100 PSI in 147 gallons per acre. Insertion of a pressure regulator for the second application brought the application rate down to 1.0 lb ai/acre in 101 gallons of finished spray per acre. The sprayers were calibrated prior to all applications by the volume/time method. In California, irrigation occurred four times with a microsprinkler irrigation that did not wet the foliage sampled. The California site had 1.3 inches of rainfall during the course of the study – the ten year average is 1.46 inches. In Florida, the rainfall per day ranged from 0.2 to 2.6 inches. The total rainfall during the sampling period was 13.7 inches – the ten year average is 20 inches.

For the Florida and California sites, on day 0 the actual DFR data are higher than the predicted DFR data. Since using the predicted values for day 0 would underestimate exposure, the actual values are also reported for day 0 for this site. Results from the regression analysis are presented in Table 10 of this report.

Table 10. Citrus Foliar Dissipation for Oxamyl (MRID 44686901)										
Site	DFR ($\mu\text{g}/\text{cm}^2$) Predicted Values – Based on Log Transformed Data (Values in Parentheses are Actual Field Measured Averages)									
	0 DAT	1 DAT	2 DAT	3 DAT	4 DAT	5 DAT	6 DAT	7 DAT	R ²	Slope ($t_{1/2}$ days) ^a
Florida	0.639 (2.14)	0.505 (1.46)	0.40 (0.477)	0.316	0.250	0.198	0.156	0.124	0.858	-0.235 (2.95)
California	0.738 (2.05)	0.683	0.632	0.585	0.541	0.501	0.463	0.429	0.76	0.078 (8.92)

a $t_{1/2}$ is the calculated half-life of oxamyl at the Florida and California site are from 0 DAT to 35 DAT.

Use of the Oxamyl DFR Study Data

The citrus DFR study data was used to assess exposure to oxamyl-treated foliage for citrus and also was used to assess exposure to foliage from the other tree crops (pears, apples, bananas, plantains, and non-bearing trees). The cucumber DFR study data was used to assess exposure to oxamyl-treated foliage for the cucurbit crops. And the tomato DFR study data were used to assess exposure to oxamyl-treated foliage for tomatoes and other fruiting vegetables (peppers and eggplant). For all the remaining crops, both the tomato residue data (MRID 44704801) and the cucumber residue data (MRID 44686902) were used to assess exposure to oxamyl-treated foliage. For all crops where both tomato and cucumber residue data are presented, the results for the California sites were averaged and the results from the Florida and Georgia sites were averaged. The DFR values from the three submitted studies were adjusted proportionately to reflect remaining crops application rates. The new DFR values are calculated as follows:

$$\text{Adjusted DFR (} \mu\text{g}/\text{cm}^2 \text{)} = \frac{\text{Study DFR (} \mu\text{g}/\text{cm}^2 \text{)} \times \text{crop application rate (lbs ai/A)}}{\text{study application rate (lbs ai/A)}}$$

4.2.1.2 Summary of Dermal Risk Concerns for Postapplication Workers

See Tables 11 and 12 for a summary of the postapplication results. The resulting postapplication assessments indicate that the MOEs equal or exceed 100 on the day specified for the following crops, according to the DFR study site and tasks that represent the highest transfer coefficient. The postapplication risk assessment indicates that for many crops, risks remain a concern for several days following application.

Table 11: Oxamyl Postapplication Risks for Tree Crops						
Crop	Appl. Rate ^a (lbs. ai/ acre)	Transfer Coefficient ^b (cm ² /hr) and Activity	DFR Data Source ^c	Dose at Day 0 ^d (mg/kg/day)	MOE at Day 0 ^e	Day After Treatment When MOE ≥100 ^f
Banana/ Plantain	3.6	2000 Training, Hand Pruning, Thinning, Topping, Hand Weeding	Florida	1.8	5	9
			California	1.7	5	27
Apples	2	3000 Hand Harvesting, Thinning, Propping, Training, Hand Pruning	Florida	1.5	6	8
			California	1.4	6	24
Citrus	2	3000 Hand Harvesting, Hand Pruning, Thinning	Florida	1.5	6	8
			California	1.4	6	24
Pears (U.S., except CA)	2	3000 Hand Harvesting, Thinning, Tying, Hand Pruning, Training	Florida	1.5	6	8
			California	1.4	6	24
Nonbearing Fruit Trees	1	400	Florida	0.098	82	1
		All Tasks	California	0.094	85	1

a. Application rates are the maximum application rates determined from EPA registered labels for oxamyl.

b. Transfer Coefficients are from Science Advisory Council on Exposure Policy 3.1. Risks were only assessed for the highest transfer coefficient available for a crop.

c. The results from the analysis using actual DFR values for Day 0. The actual DFR values were used instead of the predicted DFRs when the actual DFR values were higher than the predicted DFR values (Day 0, 1, and 2 for Citrus FL and Day 0 for Citrus CA).

DFR Data sources:

Citrus CA: MRID 44686901: Slope = -0.078, Day 0 (actual) = 2.05, Study Application Rate = 1

Citrus FL: MRID 44686901: Slope = -0.235, Day 0 (actual) = 2.14, Study Application Rate = 1

d. Daily Dose = [DFR (µg/cm²) x Transfer Coefficient (cm²/hr) x 0.001 mg/µg x 8 hrs/day] ÷ body weight (70 kg adult)

e. MOE = NOAEL/Daily Dose (Adult Dermal NOAEL = 8 mg/kg/day). Target MOE = 100

f. Day After Treatment When MOE ≥100. Values in **bold** indicate that the calculated REI is greater than 48 hrs.

Table 12: Oxamyl Postapplication Risks for Vegetable and Non-Tree Fruit Crops

Crop	Appl. Rate ^a (lbs. ai/acre)	Transfer Coefficient ^b (cm ² /hr) And Activity	DFR Data Source ^c	Dose at Day 0 ^d (mg/kg/day)	MOE at Day 0 ^e	Day After Treatment When MOE ≥100 ^f	Average Day after Treatment when MOE ≥100
Celery (FL, PA, OH, MI, TX)	2	2500 Hand harvesting	Cucumber GA	2.3	3	4	7
			Tomato FL	1.1	8	9	
			Cucumber CA	2.2	4	12	13
			Tomato CA	2.2	4	13	
Celery (AZ, CA)	0.5	2500 Hand harvesting	Cucumber GA	0.59	14	2	3
			Tomato FL	0.26	30	3	
			Cucumber CA	0.55	15	7	5
			Tomato CA	0.55	15	2	
Peppermint and Spearmint (ID, MI, MT, OR, WA, WI)	2	1500 Irrigation; scouting; hand weeding	Cucumber GA	1.4	6	3	4
			Tomato FL	0.63	13	5	
			Cucumber CA	1.3	6	10	10
			Tomato CA	1.3	6	9	
Pineapples	2	1000 Hand harvesting; hand pruning	Cucumber GA	0.94	9	3	3
			Tomato FL	0.21	38	3	
			Cucumber CA	0.88	9	8	7
			Tomato CA	0.88	9	5	
Garlic (OR, CA)	2	300 Irrigation; scouting; thinning; hand weeding	Cucumber GA	0.28	28	1	2
			Tomato FL	0.13	63	2	
			Cucumber CA	0.26	30	4	3
			Tomato CA	0.26	30	2	

Table 12: Oxamyl Postapplication Risks for Vegetable and Non-Tree Fruit Crops

Crop	Appl. Rate ^a (lbs. ai/acre)	Transfer Coefficient ^b (cm ² /hr) And Activity	DFR Data Source ^c	Dose at Day 0 ^d (mg/kg/day)	MOE at Day 0 ^e	Day After Treatment When MOE ≥100 ^f	Average Day after Treatment when MOE ≥100
Garlic (SLN NY, SLN WA)	1	300 Irrigation; scouting; thinning; hand weeding	Cucumber GA	0.14	57	1	1
			Tomato FL	0.06	130	0 (12 hours)	
			Cucumber CA	0.13	60	3	2
			Tomato CA	0.13	61	1	
Onions, Dry Bulb (OR, ID, WA, CA, MI, TX)	2	300 Irrigation; scouting; thinning; hand weeding	Cucumber GA	0.28	28	1	2
			Tomato FL	0.13	63	2	
			Cucumber CA	0.26	30	4	3
			Tomato CA	0.26	30	2	
Onions, Dry Bulb (SLN CO, SLN NV, SLN NY, SLN UT)	1	300 Irrigation; scouting; thinning; hand weeding	Cucumber GA	0.14	57	1	1
			Tomato FL	0.06	130	0 (12 hours)	
			Cucumber CA	0.13	60	3	2
			Tomato CA	0.13	61	1	
Onions, Dry Bulb (NM, SLN WI)	0.5	300 Irrigation; scouting; thinning; hand weeding	Cucumber GA	0.07	110	0 (12 hours)	0 (12 hours)
			Tomato FL	0.03	250	0 (12 hours)	
			Cucumber CA	0.07	120	0 (12 hours)	0 (12 hours)
			Tomato CA	0.07	120	0 (12 hours)	
Clover Grown for Seed (SLN CA)	1.0	1500 Irrigation; scouting;	Cucumber GA	0.7	11	2	3
			Tomato FL	0.32	25	4	
			Cucumber CA	0.66	12	7	5
			Tomato CA	0.66	12	3	

Table 12: Oxamyl Postapplication Risks for Vegetable and Non-Tree Fruit Crops

Crop	Appl. Rate ^a (lbs. ai/acre)	Transfer Coefficient ^b (cm ² /hr) And Activity	DFR Data Source ^c	Dose at Day 0 ^d (mg/kg/day)	MOE at Day 0 ^e	Day After Treatment When MOE ≥100 ^f	Average Day after Treatment when MOE ≥100
Carrot	1	2500 Hand harvesting;	Cucumber GA	1.2	7	3	4
			Tomato FL	0.53	15	5	
			Cucumber CA	1.1	7	9	8
			Tomato CA	1.1	7	7	
Cucurbits	1	2500 Hand harvesting; hand pruning, thinning	Cucumber GA	1.2	7	3	3
			Cucumber CA	1.1	7	9	9
Cotton (AZ and CA)	1	2500 Hand harvesting;	Cucumber GA	1.2	7	3	4
			Tomato FL	0.53	15	5	
			Cucumber CA	1.1	7	9	8
			Tomato CA	1.1	7	7	
Cotton (U.S. except AZ and CA);	0.5	2500 Hand harvesting	Cucumber GA	0.59	14	2	3
			Tomato FL	0.26	30	3	
			Cucumber CA	0.55	15	7	5
			Tomato CA	0.55	15	2	
Potatoes (SLN MD, SLN NY)	2	1500 Irrigation; scouting	Cucumber GA	1.4	6	3	4
			Tomato FL	0.63	13	5	
			Cucumber CA	1.3	6	10	10
			Tomato CA	1.3	6	9	
Potatoes (also SLN PA)	1	1500 Irrigation; scouting	Cucumber GA	0.7	11	2	3
			Tomato FL	0.32	25	4	
			Cucumber CA	0.66	12	7	5
			Tomato CA	0.66	12	3	

Table 12: Oxamyl Postapplication Risks for Vegetable and Non-Tree Fruit Crops							
Crop	Appl. Rate ^a (lbs. ai/ acre)	Transfer Coefficient ^b (cm ² /hr) And Activity	DFR Data Source ^c	Dose at Day 0 ^d (mg/kg/day)	MOE at Day 0 ^e	Day After Treatment When MOE ≥100 ^f	Average Day after Treatment when MOE ≥100
Eggplant; Tomatoes; Peppers	1	1000 Hand harvesting; hand pruning (eggplant and tomato); staking; tying, thinning (tomato); training (tomato)	Tomato FL	0.21	38	3	3
			Tomato CA	0.44	18	2	2
Ginger Root (HI)	1	300 Irrigation; scouting; thinning; hand weeding	Cucumber GA	0.14	57	1	1
			Tomato FL	0.06	130	0 (12 hours)	
			Cucumber CA	0.13	60	3	2
			Tomato CA	0.13	61	1	
Peanuts (U.S. except CA)	0.5	1500 Irrigation; scouting	Cucumber GA	0.35	23	1	2
			Tomato FL	0.16	50	2	
			Cucumber CA	0.33	24	5	4
			Tomato CA	0.33	24	2	

a. Application rates are the maximum application rates determined from EPA registered labels for oxamyl.

b. Transfer Coefficients are from Science Advisory Council on Exposure Policy 3.1. Risks were only assessed for the highest transfer coefficient available for a crop.

c. The results from the analysis using actual DFR values for Day 0 for cucumber GA, cucumber CA, and tomato CA. The actual DFR values were used instead of the predicted DFRs when the actual DFR values were significantly higher than the predicted DFR values. An analysis using actual DFR values was not necessary for the tomato data from Florida.

DFR Data sources:

- Cucumber CA: MRID 44686902: Study Application Rate = 1, Slope = -0.282, Day 0 (predicted) = 3.2 µg/cm², Day 0 (actual) = 3.86 µg/cm², Day 1 (actual) = 3.42 µg/cm², Day 2 (actual) = 2.83 µg/cm², Day 3 (predicted) = 1.37 µg/cm², Day 4 (predicted) = 1.03 µg/cm², Day 5 (predicted) = 0.778 µg/cm².
- Tomato CA: MRID 44704801: Study Application Rate = 1, Slope = -0.119, Day 0 (predicted) = 0.61 µg/cm², Day 0 (actual) = 3.83 µg/cm², Day 1 (actual) = 1.29 µg/cm², Day 2 (predicted) = 0.48 µg/cm², Day 3 (predicted) = 0.43 µg/cm², Day 4 (predicted) = 0.38 µg/cm², Day 5 (predicted) = 0.34 µg/cm², Day 6 (predicted) = 0.30 µg/cm².
- Cucumber GA: MRID 44686902: Study Application Rate = 1 lb ai/A, Slope (predicted) = -0.508, Day 0 (predicted) = 1, Day 0 (actual) = 4.11 µg/cm², Day 1 (actual) = 0.869 µg/cm², Day 2 (predicted) = 0.36 µg/cm², Day 3 (predicted) = 0.21 µg/cm².
- Tomato FL: MRID 44704801: Study Application Rate = 1, Slope = -0.425, Day 0 (predicted) = 1.85

d. Daily Dose = [DFR (µg/cm²) x Transfer Coefficient (cm²/hr) x 0.001 mg/µg x 8 hrs/day] ÷ body weight (70 kg adult)

e. MOE = NOAEL/Daily Dose (Adult Dermal NOAEL = 8 mg/kg/day). Target MOE = 100

f. Day After Treatment When MOE ≥100. Values in **bold** indicate that the calculated REI is greater than 48 hrs.

4.2.2 Occupational Inhalation Postapplication Exposures

Based on the Agency's current practices, a quantitative occupational postapplication inhalation exposure assessment was not performed for oxamyl at this time. However, there are multiple potential sources of postapplication inhalation exposure to individuals performing postapplication activities in previously treated fields. These potential sources include volatilization of pesticides and resuspension of dusts and/or particulates that contain pesticides. The Agency sought expert advice and input on issues related to volatilization of pesticides from its Federal Insecticide, Fungicide, and Rodenticide Act Scientific Advisory Panel (SAP) in December 2009. The Agency received the SAP's final report on March 2, 2010 (<http://www.epa.gov/scipoly/SAP/meetings/2009/120109meeting.html>). The Agency is in the process of evaluating the SAP report as well as available postapplication inhalation exposure data generated by the Agricultural Reentry Task Force and may, as appropriate, develop policies and procedures, to identify the need for and, subsequently, the way to incorporate occupational postapplication inhalation exposure into the Agency's risk assessments. If new policies or procedures are put into place, the Agency may revisit the need for a quantitative occupational postapplication inhalation exposure assessment for oxamyl. [Note: Oxamyl could potentially be used on crops in greenhouses. The Worker Protection Standard for Agricultural Pesticides contains requirements for protecting workers from inhalation exposures during and after greenhouse applications through the use of ventilation requirements.]

5.0 RESIDENTIAL (NON-OCCUPATIONAL) EXPOSURE/RISK PATHWAY

5.1 Residential Exposure

This document presents the assessment of agricultural uses of oxamyl. No residential uses and no occupational uses at residential sites are registered for oxamyl; therefore, no residential risk assessment has been conducted.

5.2 Spray Drift

Spray drift is always a potential source of exposure to residents nearby to spraying operations. This is particularly the case with aerial application, but, to a lesser extent, could also be a potential source of exposure from the ground application method employed for oxamyl. The Agency has been working with the Spray Drift Task Force, EPA Regional Offices and State Lead Agencies for pesticide regulation and other parties to develop the best spray drift management practices (see the Agency's Spray Drift website for more information at <http://www.epa.gov/opp00001/factsheets/spraydrift.htm>). On a chemical by chemical basis, the Agency is now requiring interim mitigation measures for aerial applications that must be placed on product labels/labeling. The Agency has completed its evaluation of the new database submitted by the Spray Drift Task Force, a membership of U.S. pesticide registrants, and is developing a policy on how to appropriately apply the data and the AgDRIFT computer model to its risk assessments for pesticides applied by air, orchard airblast and ground hydraulic methods.

After the policy is in place, the Agency may impose further refinements in spray drift management practices to reduce off-target drift with specific products with significant risks

associated with drift.

5.3 Residential Bystander Postapplication Inhalation Exposure

Based on the Agency's current practices, a quantitative residential bystander postapplication inhalation exposure assessment was not performed for oxamyl at this time. However, volatilization of pesticides may be a potential source of postapplication inhalation exposure to individuals nearby to pesticide applications. The Agency sought expert advice and input on issues related to volatilization of pesticides from its Federal Insecticide, Fungicide, and Rodenticide Act Scientific Advisory Panel (SAP) in December 2009. The Agency received the SAP's final report on March 2, 2010 (<http://www.epa.gov/scipoly/SAP/meetings/2009/120109meeting.html>). The Agency is in the process of evaluating the SAP report and may, as appropriate, develop policies and procedures, to identify the need for and, subsequently, the way to incorporate postapplication inhalation exposure into the Agency's risk assessments. If new policies or procedures are put into place, the Agency may revisit the need for a quantitative postapplication inhalation exposure assessment for oxamyl.

APPENDIX A Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risks at Baseline.										
Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregate ^d Risk Index (LOC = 1)
				Dermal (mg/lb ai)	Inhalation (µg/lb ai)	Dermal ^e (mg/kg/day)	Inhalation ^f (mg/kg/day)	Dermal ^g (LOC =100)	Inhalation ^h (LOC = 30)	
Mixer/Loader										
Mixing/Loading Liquid Concentrates for Aerial Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA), Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	2.9	1.2	15	0.006	0.55	65	0.0055
	Cotton (CA and AZ)	1	1200	2.9	1.2	50	0.021	0.16	19	0.0016
	Cotton (not AZ and CA)	0.5	1200	2.9	1.2	25	0.01	0.32	38	0.0032
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	2.9	1.2	7.3	0.003	1.10	130	0.011

APPENDIX A Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risks at Baseline.										
Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregate ^d Risk Index (LOC = 1)
				Dermal (mg/lb ai)	Inhalation (µg/lb ai)	Dermal ^e (mg/kg/day)	Inhalation ^f (mg/kg/day)	Dermal ^g (LOC =100)	Inhalation ^h (LOC = 30)	
Mixing/Loading Liquid Concentrates for Chemigation Applications (PHED)	Apples; Carrot (not CA); Celery (FL, PA, OH, MI, TX); Citrus; Eggplant (not CA); Garlic (CA, OR); Dry Bulb Onions (CA, OR, ID, WA, MI, TX); Pears (not CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Pineapple (not CA); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco; Tomatoes	2	350	2.9	1.2	29	0.012	0.28	33	0.0028
	Apples for Thinning (NJ, PA, VA, WV); Cotton (CA and AZ); Cucurbits; Dry Bulb Onions (SLN CO, SLN NV, SLN UT); Eggplant (CA); Garlic (SLNWA); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Peppers; Potatoes	1	350	2.9	1.2	15	0.006	0.55	65	0.0055
	Celery (AZ, CA); Cotton (not CA and AZ); Dry Bulb Onions (NM); Peanuts (not CA); Yams (Puerto Rico only)	0.5	350	2.9	1.2	7.3	0.003	1.10	130	0.011

APPENDIX A Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risks at Baseline.										
Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregate ^d Risk Index (LOC = 1)
				Dermal (mg/lb ai)	Inhalation (µg/lb ai)	Dermal ^e (mg/kg/day)	Inhalation ^f (mg/kg/day)	Dermal ^g (LOC =100)	Inhalation ^h (LOC = 30)	
Mixing/Loading Liquids Concentrates for Groundboom Applications (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear; soil); Carrots (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Roots (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	2.9	1.2	13	0.0055	0.60	71	0.006
	Pineapples (not CA); Eggplants (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	2.9	1.2	6.6	0.0027	1.20	140	0.012
	Tomatoes (CA)	1.25	80	2.9	1.2	4.1	0.0017	1.90	230	0.019
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (SLN CO, SLN NV, SLN UT); Eggplants (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes (entire US)	1	80	2.9	1.2	3.3	0.0014	2.40	280	0.024
	Cotton (AZ and CA)	1	200	2.9	1.2	8.3	0.0034	0.97	110	0.0096
	Cotton (U.S. except CA and AZ)	0.5	200	2.9	1.2	4.1	0.0017	1.90	230	0.019
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	2.9	1.2	1.7	0.00069	4.80	570	0.048

APPENDIX A Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risks at Baseline.										
Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregate ^d Risk Index (LOC = 1)
				Dermal (mg/lb ai)	Inhalation (µg/lb ai)	Dermal ^e (mg/kg/day)	Inhalation ^f (mg/kg/day)	Dermal ^g (LOC =100)	Inhalation ^h (LOC = 30)	
Mixing/Loading Liquids Concentrates for Airblast Applications (PHED)	Apples; Pears (not CA)	2	40	2.9	1.2	3.3	0.0014	2.40	280	0.024
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	2.9	1.2	1.7	0.00069	4.80	570	0.048
Applicator										
Applying Sprays via Aerial Equipment (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	No Data	No Data	No Data	No Data	No Data	No Data	No Data
	Cotton (CA and AZ)	1	1,200	No Data	No Data	No Data	No Data	No Data	No Data	No Data
	Cotton (not AZ and CA)	0.5	1,200	No Data	No Data	No Data	No Data	No Data	No Data	No Data
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	No Data	No Data	No Data	No Data	No Data	No Data	No Data

APPENDIX A Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risks at Baseline.										
Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregate ^d Risk Index (LOC = 1)
				Dermal (mg/lb ai)	Inhalation (μg/lb ai)	Dermal ^e (mg/kg/day)	Inhalation ^f (mg/kg/day)	Dermal ^g (LOC =100)	Inhalation ^h (LOC = 30)	
Applying Sprays via Groundboom Equipment (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear); Carrot (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Root (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	0.014	0.74	0.064	0.0034	130	120	0.94
	Pineapple (not CA); Eggplant (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	0.014	0.74	0.032	0.0017	250	230	1.9
	Tomatoes (CA)	1.25	80	0.014	0.74	0.02	0.0011	400	370	3
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (SLN CO, SLN NV, SLN UT); Eggplant (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes (entire US)	1	80	0.014	0.74	0.016	0.00085	500	460	3.8
	Cotton (AZ and CA)	1	200	0.014	0.74	0.04	0.0021	200	180	1.5
	Cotton (U.S. except CA and AZ)	0.5	200	0.014	0.74	0.02	0.0011	400	370	3
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	0.014	0.74	0.008	0.00042	1000	920	7.5

APPENDIX A Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risks at Baseline.										
Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregate ^d Risk Index (LOC = 1)
				Dermal (mg/lb ai)	Inhalation (µg/lb ai)	Dermal ^e (mg/kg/day)	Inhalation ^f (mg/kg/day)	Dermal ^g (LOC = 100)	Inhalation ^h (LOC = 30)	
Applying Sprays via Airblast Equipment PHED)	Apples; Pears (not CA)	2	40	0.36	4.5	0.41	0.0051	19	76	0.18
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	0.36	4.5	0.21	0.0026	39	150	0.4
Flagger										
Flagging for Aerial Sprays Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies); Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	0.011	0.35	0.055	0.0018	150	220	1.2
	Cotton (CA and AZ)	1	350	0.011	0.35	0.055	0.0018	150	220	1.2
	Cotton (U.S. except AZ and CA)	0.5	350	0.011	0.35	0.028	0.00088	290	450	2.4
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	0.011	0.35	0.028	0.00088	290	450	2.4

APPENDIX A Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risks at Baseline.										
Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregate ^d Risk Index (LOC = 1)
				Dermal (mg/lb ai)	Inhalation (μg/lb ai)	Dermal ^e (mg/kg/day)	Inhalation ^f (mg/kg/day)	Dermal ^g (LOC =100)	Inhalation ^h (LOC = 30)	
Mixer/Loader/Applicator										
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (PHED)	Bananas, Plantains (PR)	3.6	2	100	30	10	0.0031	0.78	130	0.0078
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (ORETF, ground directed)	Bananas, Plantains (PR)	3.6	2	15	2.7	1.5	0.00028	5.20	1,400	0.052
Mixing/Loading/Applying Liquid Concentrates with a Handgun Sprayer (LCO ORETF data)	Nonbearing Fruit (apple, cherry, citrus, peach, pear)	4	5	No Data	1.8	No Data	0.00051	No Data	760	No Data
	Apples; Pears (not CA)	2	5	No Data	1.8	No Data	0.00026	No Data	1,500	No Data
	Apples for Thinning (NJ, PA, VA, WV); Citrus	1	5	No Data	1.8	No Data	0.00013	No Data	3,000	No Data

Footnotes

a. Application rates are maximum application rates from the labels.

b. Science Advisory Council Policy # 9.1

c. Unit Exposures based on PHED Version 1.1 and ORETF. Baseline dermal unit exposure represents long pants, long sleeved shirt, no gloves, open mixing/loading, open cab tractor. Baseline inhalation exposure represents no respirator.

d. Only engineering control (enclosed cockpit) data are available to assess dermal and inhalation risks to handlers operating aircraft. Only baseline attire (single layer of clothing) plus chemical-resistant glove data are available to assess dermal risks to handlers mixing/loading/applying liquid concentrates with a handgun sprayer.

e. Dermal Dose (mg/kg/day) = daily unit exposure (mg/lb ai) x application rate (lb ai/acre) x acres treated / body weight (70 kg).

f. Inhalation Dose (mg/kg/day) = daily unit exposure (µg/lb ai) x conversion factor (1 mg/1,000 µg) x application rate (lb ai/acre) x acres treated / body weight (70 kg).

g. Dermal MOE = NOAEL (8 mg/kg/day) / dermal daily dose (mg/kg/day). Level of concern = 100.

- h. Inhalation MOE = NOAEL (0.39 mg/kg/day) / inhalation daily dose (mg/kg/day). Level of concern = 30.
- i. Aggregated Risk Index (ARI) -- combined dermal and inhalation risks = $1 / (1/ (\text{Dermal MOE} / 300) + 1/ (\text{Inhalation MOE} / 100))$. Level of concern = 1.

APPENDIX B Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Personal Protective Equipment.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – PPE-G + Baseline Inhalation (LOC = 1)
				Dermal PPE-G (mg/lb ai)	Baseline Inhalation (µg/lb ai)	Dermal PPE-G ^d (mg/kg/day)	Baseline Inhalation ^e (mg/kg/day)	Dermal PPE-G ^f (LOC = 100)	Baseline Inhalation ^g (LOC = 30)	
Mixer/Loader										
Mixing/Loading Liquid Concentrates for Aerial Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN-PA); Tomatoes	1	350	0.023	1.2	0.12	0.006	70	65	0.53
	Cotton (CA and AZ)	1	1200	0.023	1.2	0.39	0.021	20	19	0.15
	Cotton (not AZ and CA)	0.5	1200	0.023	1.2	0.2	0.01	41	38	0.31
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	0.023	1.2	0.058	0.003	140	130	1.1

APPENDIX B Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Personal Protective Equipment.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – PPE-G + Baseline Inhalation (LOC = 1)
				Dermal PPE-G (mg/lb ai)	Baseline Inhalation (µg/lb ai)	Dermal PPE-G ^d (mg/kg/day)	Baseline Inhalation ^e (mg/kg/day)	Dermal PPE-G ^f (LOC = 100)	Baseline Inhalation ^g (LOC = 30)	
Mixing/Loading Liquid Concentrates for Chemigation Applications (PHED)	Apples; Carrot (not CA); Celery (FL, PA, OH, MI, TX); Citrus; Eggplant (not CA); Garlic (CA, OR); Dry Bulb Onions (CA, OR, ID, WA, MI, TX); Pears (not CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Pineapple (not CA); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco; Tomatoes	2	350	0.023	1.2	0.23	0.012	35	33	0.26
	Apples for Thinning (NJ, PA, VA, WV); Cotton (CA and AZ); Cucurbits; Eggplant (CA); Garlic (SLNWA); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Peppers; Potatoes	1	350	0.023	1.2	0.12	0.006	70	65	0.53
	Celery (AZ, CA); Cotton (not CA and AZ); Dry Bulb Onions (NM); Peanuts (not CA); Yams (Puerto Rico only)	0.5	350	0.023	1.2	0.058	0.003	140	130	1.1

APPENDIX B Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Personal Protective Equipment.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – PPE-G + Baseline Inhalation (LOC = 1)
				Dermal PPE-G (mg/lb ai)	Baseline Inhalation (μg/lb ai)	Dermal PPE-G ^d (mg/kg/day)	Baseline Inhalation ^e (mg/kg/day)	Dermal PPE-G ^f (LOC = 100)	Baseline Inhalation ^g (LOC = 30)	
Mixing/Loading Liquid Concentrates for Groundboom Applications (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear; soil); Carrots (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Roots (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	0.023	1.2	0.11	0.0055	76	71	0.58
	Pineapples (not CA); Eggplants (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	0.023	1.2	0.053	0.0027	150	140	1.2
	Tomatoes (CA)	1.25	80	0.023	1.2	0.033	0.0017	240	230	1.8
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (, SLN CO, SLN NV, SLN UT); Eggplants (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes	1	80	0.023	1.2	0.026	0.0014	300	280	2.3
	Cotton (AZ and CA)	1	200	0.023	1.2	0.066	0.0034	120	110	0.92
	Cotton (U.S. except CA and AZ)	0.5	200	0.023	1.2	0.033	0.0017	240	230	1.8
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	0.023	1.2	0.013	0.00069	610	570	4.6

APPENDIX B Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Personal Protective Equipment.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – PPE-G + Baseline Inhalation (LOC = 1)
				Dermal PPE-G (mg/lb ai)	Baseline Inhalation (µg/lb ai)	Dermal PPE-G ^d (mg/kg/day)	Baseline Inhalation ^e (mg/kg/day)	Dermal PPE-G ^f (LOC = 100)	Baseline Inhalation ^g (LOC = 30)	
Mixing/Loading Liquid Concentrates for Airblast Applications (PHED)	Apples; Pears (not CA)	2	40	0.023	1.2	0.026	0.0014	300	280	2.3
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	0.023	1.2	0.013	0.00069	610	570	4.6
Applicator										
Applying Sprays via Aerial Equipment (PHED) ^d	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT, SLN WI); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	No Data	No Data	No Data	No Data	No Data	No Data	No Data
	Cotton (CA and AZ)	1	1200	No Data	No Data	No Data	No Data	No Data	No Data	No Data
	Cotton (not AZ and CA)	0.5	1200	No Data	No Data	No Data	No Data	No Data	No Data	No Data
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX); Peanuts (not CA)	0.5	350	No Data	No Data	No Data	No Data	No Data	No Data	No Data

APPENDIX B Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Personal Protective Equipment.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – PPE-G + Baseline Inhalation (LOC = 1)
				Dermal PPE-G (mg/lb ai)	Baseline Inhalation (µg/lb ai)	Dermal PPE-G ^d (mg/kg/day)	Baseline Inhalation ^e (mg/kg/day)	Dermal PPE-G ^f (LOC = 100)	Baseline Inhalation ^g (LOC = 30)	
Applying Sprays via Groundboom Equipment (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear); Carrot (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Root (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	0.014	0.74	0.064	0.0034	130	120	0.94
	Pineapple (not CA); Eggplant (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	0.014	0.74	0.032	0.0017	250	230	1.9
	Tomatoes (CA)	1.25	80	0.014	0.74	0.02	0.0011	400	370	3
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (SLN CO, SLN NV, SLN U T); Eggplant (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes	1	80	0.014	0.74	0.016	0.00085	500	460	3.8
	Cotton (AZ and CA)	1	200	0.014	0.74	0.04	0.0021	200	180	1.5
	Cotton (U.S. except CA and AZ)	0.5	200	0.014	0.74	0.02	0.0011	400	370	3
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	0.014	0.74	0.008	0.00042	1000	920	7.5

APPENDIX B Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Personal Protective Equipment.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – PPE-G + Baseline Inhalation (LOC = 1)
				Dermal PPE-G (mg/lb ai)	Baseline Inhalation (µg/lb ai)	Dermal PPE-G ^d (mg/kg/day)	Baseline Inhalation ^e (mg/kg/day)	Dermal PPE-G ^f (LOC = 100)	Baseline Inhalation ^g (LOC = 30)	
Applying Sprays via Airblast Equipment (PHED)	Apples; Pears (not CA)	2	40	0.24	4.5	0.27	0.0051	29	76	0.26
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	0.24	4.5	0.14	0.0026	58	150	0.52
Flagger										
Flagging for Aerial Sprays Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT, SLN WI); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	Not applicable	0.35	Not applicable	0.0018	Not applicable	220	Not applicable
	Cotton (CA and AZ)	1	350	Not applicable	0.35	Not applicable	0.0018	Not applicable	220	Not applicable
	Cotton (U.S. except AZ and CA)	0.5	350	Not applicable	0.35	Not applicable	0.00088	Not applicable	450	Not applicable
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX); Peanuts (not CA)	0.5	350	Not applicable	0.35	Not applicable	0.00088	Not applicable	450	Not applicable

APPENDIX B Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Personal Protective Equipment.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – PPE-G + Baseline Inhalation (LOC = 1)
				Dermal PPE-G (mg/lb ai)	Baseline Inhalation (µg/lb ai)	Dermal PPE-G ^d (mg/kg/day)	Baseline Inhalation ^e (mg/kg/day)	Dermal PPE-G ^f (LOC = 100)	Baseline Inhalation ^g (LOC = 30)	
Mixer/Loader/Applicator										
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (PHED)	Bananas, Plantains (PR)	3.6	2	0.43	30	0.044	0.0031	180	130	1.3
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (ORETF, ground directed)	Bananas, Plantains (PR)	3.6	2	0.33	2.7	0.034	0.00028	240	1400	2.3
Mixing/Loading/Applying Liquid Concentrates with a Handgun Sprayer (LCO ORETF data)	Nonbearing Fruit (apple, cherry, citrus, peach, pear)	4	5	0.45	1.8	0.13	0.00051	62	760	0.61
	Apples; Pears (not CA)	2	5	0.45	1.8	0.064	0.00026	120	1500	1.2
Mixing/Loading/Applying Liquid Concentrates with a Handgun Sprayer (LCO ORETF data) cont	Apples for Thinning (NJ, PA, VA, WV); Citrus	1	5	0.45	1.8	0.032	0.00013	250	3000	2.4

Footnotes

a. Application rates are maximum application rates from the labels.

b. Science Advisory Council Policy # 9.1

c. Unit Exposures based on PHED Version 1.1 and ORETF.

Baseline dermal unit exposure represents long pants, long sleeved shirt, no gloves, open mixing/loading, open cab tractor.

Baseline inhalation exposure represents no respirator.

PPE – G = Baseline attire (single layer of clothing) plus chemical-resistant gloves.

EC = Engineering Control = closed systems for mixing/loading liquids, enclosed cockpits for aerial application, and enclosed cabs for airblast application.

d. Only engineering control (enclosed cockpit) data are available to assess dermal and inhalation risks to handlers operating aircraft.

e. Dermal Dose (mg/kg/day) = daily unit exposure (mg/lb ai) x application rate (lb ai/acre) x acres treated / body weight (70 kg).

f. Inhalation Dose (mg/kg/day) = daily unit exposure (µg/lb ai) x conversion factor (1 mg/1,000 µg) x application rate (lb ai/acre) x acres treated / body weight (70 kg).

g. Dermal MOE = NOAEL (8 mg/kg/day) / dermal daily dose (mg/kg/day). Level of concern = 100.

h. Inhalation MOE = NOAEL (0.39 mg/kg/day) / inhalation daily dose (mg/kg/day). Level of concern = 30.

i. Aggregated Risk Index (ARI) -- combined dermal and inhalation risks = 1 / (1/ (Dermal MOE /300) + 1/ (Inhalation MOE / 100)). Level of concern = 1.

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
Mixer/Loader										
Mixing/Loading Liquid Concentrates for Aerial Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN-PA); Tomatoes	1	350	0.0086	0.083	0.043	0.00042	190	940	1.8
	Cotton (CA and AZ)	1	1200	0.0086	0.083	0.15	0.0014	54	270	0.51
	Cotton (not AZ and CA)	0.5	1200	0.0086	0.083	0.074	0.00071	110	550	1.0
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX, SLN WI); Peanuts (not CA)	0.5	350	0.0086	0.083	0.022	0.00021	370	1900	3.5

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
Mixing/Loading Liquid Concentrates for Chemigation Applications (PHED)	Apples; Carrot (not CA); Celery (FL, PA, OH, MI, TX); Citrus; Eggplant (not CA); Garlic (CA, OR); Dry Bulb Onions (CA, OR, ID, WA, MI, TX); Pears (not CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Pineapple (not CA); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco; Tomatoes	2	350	0.0086	0.083	0.086	0.00083	93	470	0.88
	Apples for Thinning (NJ, PA, VA, WV); Cotton (CA and AZ); Cucurbits; Eggplant (CA); Garlic (SLNWA); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Peppers; Potatoes	1	350	0.0086	0.083	0.043	0.00042	190	940	1.8
	Celery (AZ, CA); Cotton (not CA and AZ); Dry Bulb Onions (NM); Peanuts (not CA); Yams (Puerto Rico only)	0.5	350	0.0086	0.083	0.022	0.00021	370	1900	3.5

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
Mixing/Loading Liquid Concentrates for Groundboom Applications (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear; soil); Carrots (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Roots (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	0.0086	0.083	0.039	0.00038	200	1000	1.9
	Pineapples (not CA); Eggplants (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	0.0086	0.083	0.02	0.00019	410	2100	3.8
	Tomatoes (CA)	1.25	80	0.0086	0.083	0.012	0.00012	650	3300	6.1
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (, SLN CO, SLN NV, SLN UT); Eggplants (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes (entire US)	1	80	0.0086	0.083	0.0098	0.000095	810	4100	7.7
	Cotton (AZ and CA)	1	200	0.0086	0.083	0.025	0.00024	330	1600	3.1
	Cotton (U.S. except CA and AZ)	0.5	200	0.0086	0.083	0.012	0.00012	650	3300	6.1
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	0.0086	0.083	0.0049	0.000047	1600	8200	15

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
Mixing/Loading Liquid Concentrates for Airblast Applications (PHED)	Apples; Pears (not CA)	2	40	0.0086	0.083	0.0098	0.000095	810	4100	7.7
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	0.0086	0.083	0.0049	0.000047	1600	8200	15
Applicator										
Applying Sprays via Aerial Equipment (PHED) ^d	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT, SLN WI); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	0.005	0.068	0.025	0.00034	320	1100	3.0
	Cotton (CA and AZ)	1	1200	0.005	0.068	0.086	0.0012	93	330	0.86
	Cotton (not AZ and CA)	0.5	1200	0.005	0.068	0.043	0.00058	190	670	1.7
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX); Peanuts (not CA)	0.5	350	0.005	0.068	0.013	0.00017	640	2300	5.9

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
Applying Sprays via Groundboom Equipment (PHED)	Nonbearing Fruit (apple, cherry, citrus, peach, pear); Carrot (not CA); Celery (FL, PA, OH, MI, TX); Cucurbits (East of Rockies); Garlic (OR, SLN NY); Ginger Root (HI); Dry Bulb Onions (MI, TX, OR, ID, WA, SLN NY, SLN WI); Sweet Potatoes (not in CA); Potatoes (U.S. except Northeast, Mid-Atlantic States)	4 (all soil-directed)	80	0.005	0.74 (baseline inhalation)	0.023	0.0034 (baseline inhalation)	350	120 (baseline inhalation)	1.8 (baseline inhalation)
	Pineapple (not CA); Eggplant (not CA); Garlic (CA); Dry Bulb Onions (CA); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Potatoes (SLN MD, SLN NY, SLN PA); Tobacco	2	80	0.005	0.74 (baseline inhalation)	0.011	0.0017 (baseline inhalation)	700	230 (baseline inhalation)	3.7 (baseline inhalation)
	Tomatoes (CA)	1.25	80	0.005	0.74 (baseline inhalation)	0.0071	0.0011 (baseline inhalation)	1100	370 (baseline inhalation)	5.9 (baseline inhalation)
	Clover Grown for Seed (SLN CA); Cucurbits (West of Rockies); Dry Bulb Onions (SLN CO, SLN NV, SLN U T); Eggplant (CA); Garlic (SLNWA); Peppers; Potatoes (Northeast and Mid-Atlantic States); Tomatoes (entire US)	1	80	0.005	0.74 (baseline inhalation)	0.0057	0.00085 (baseline inhalation)	1400	460 (baseline inhalation)	7.3 (baseline inhalation)
	Cotton (AZ and CA)	1	200	0.005	0.74 (baseline inhalation)	0.014	0.0021 (baseline inhalation)	560	180 (baseline inhalation)	2.9 (baseline inhalation)
	Cotton (U.S. except CA and AZ)	0.5	200	0.005	0.74 (baseline inhalation)	0.0071	0.0011 (baseline inhalation)	1100	370 (baseline inhalation)	5.9 (baseline inhalation)

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
)				inhalation)	inhalation)
	Celery (AZ, CA); Dry Bulb Onions (NM); Yams (Puerto Rico Only); Peanuts (not in CA)	0.5	80	0.005	0.74 (baseline inhalation)	0.0029	0.00042 (baseline inhalation)	2800	920 (baseline inhalation)	15 (baseline inhalation)
Applying Sprays via Airblast Equipment (PHED)	Apples; Pears (not CA)	2	40	0.019	4.5 (baseline inhalation)	0.022	0.0051 (baseline inhalation)	370	76 (baseline inhalation)	1.5 (baseline inhalation)
	Apples for Thinning (NJ, PA, VA, WV); Citrus; Nonbearing Fruit (apple, cherry, citrus, peach, pear)	1	40	0.019	4.5 (baseline inhalation)	0.011	0.0026 (baseline inhalation)	740	150 (baseline inhalation)	3 (baseline inhalation)
Flagger										
Flagging for Aerial Sprays Applications (PHED)	Apples (WA only); Citrus; Clover Grown for Seed (SLN CA); Cucurbits (East of Rockies), Garlic (OR & CA - Modoc & Siskiyou counties, SLN NY); Nonbearing Fruit (apple, cherry, citrus, peach, pear); Dry Bulb Onions (CA - Modoc & Siskiyou counties, OR, ID, WA, SLN CO, SLN NV, SLN NY, SLN UT, SLN WI); Peppermint and Spearmint (ID, MI, MT, OR, WA, WI); Peppers; Potatoes (also SLN PA); Tomatoes	1	350	0.00022	0.35 (baseline inhalation)	0.0011	0.0018 (baseline inhalation)	7300	220 (baseline inhalation)	6.7 (baseline inhalation)
	Cotton (CA and AZ)	1	350	0.00022	0.35 (baseline inhalation)	0.0011	0.0018 (baseline inhalation)	7300	220 (baseline inhalation)	6.7 (baseline inhalation)

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
)					
	Cotton (U.S. except AZ and CA)	0.5	350	0.00022	0.35 (baseline inhalation)	0.00055	0.00088 (baseline inhalation)	15000	450 (baseline inhalation)	13 (baseline inhalation)
	Celery (AZ, CA, FL); Dry Bulb Onions (MI, NM, TX); Peanuts (not CA)	0.5	350	0.00022	0.35 (baseline inhalation)	0.00055	0.00088 (baseline inhalation)	15000	450 (baseline inhalation)	13 (baseline inhalation)

APPENDIX C Occupational Short-Term and Intermediate-Term Dermal and Inhalation Oxamyl Doses and Risk with Engineering Controls.

Exposure Scenario	Crop or Target	Application Rate ^a (lb ai/A)	Area Treated Daily ^b (acres)	Unit Exposure ^{c, d}		Dose		MOEs		Aggregated Risk Index ⁱ – Eng Cntl Dermal + Eng Cntl Inhalation (LOC = 1)
				Dermal Eng Cntl (mg/lb ai)	Inhalation Eng Cntl (µg/lb ai)	Dermal Eng Cntl ^d (mg/kg/day)	Inhalation Eng Cntl ^e (mg/kg/day)	Dermal Eng Cntl ^f (LOC = 100)	Inhalation Eng Cntl ^g (LOC = 30)	
Mixer/Loader/Applicator										
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (PHED)	Bananas, Plantains (PR)	3.6	2	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible
Mixing/Loading/Applying Liquid Concentrates with Low Pressure Handwand (ORETF, ground directed)	Bananas, Plantains (PR)	3.6	2	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible
Mixing/Loading/Applying Liquid Concentrates with a Handgun Sprayer (LCO ORETF data)	Nonbearing Fruit (apple, cherry, citrus, peach, pear)	4	5	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible
	Apples; Pears (not CA)	2	5	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible
Mixing/Loading/Applying Liquid Concentrates with a Handgun Sprayer (LCO ORETF data) cont	Apples for Thinning (NJ, PA, VA, WV); Citrus	1	5	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible

Footnotes

a. Application rates are maximum application rates from the labels.

b. Science Advisory Council Policy # 9.1

c. Unit Exposures based on PHED Version 1.1 and ORETF.

EC = Engineering Control = closed systems for mixing/loading liquids, enclosed cockpits for aerial application, and enclosed cabs for groundboom and airblast application, and enclosed cabs for flaggers.

Baseline inhalation exposure represents no respirator.

d. Only engineering control (enclosed cockpit) data are available to assess dermal and inhalation risks to handlers operating aircraft.

e. Dermal Dose (mg/kg/day) = daily unit exposure (mg/lb ai) x application rate (lb ai/acre) x acres treated / body weight (70 kg).

f. Inhalation Dose (mg/kg/day) = daily unit exposure (µg/lb ai) x conversion factor (1 mg/1,000 µg) x application rate (lb ai/acre) x acres treated / body weight (70 kg).

g. Dermal MOE = NOAEL (8 mg/kg/day) / dermal daily dose (mg/kg/day). Level of concern = 100.

- h. Inhalation MOE = NOAEL (0.39 mg/kg/day) / inhalation daily dose (mg/kg/day). Level of concern = 30.
- i. Aggregated Risk Index (ARI) -- combined dermal and inhalation risks = $1 / (1/ (\text{Dermal MOE} / 300) + 1/ (\text{Inhalation MOE} / 100))$. Level of concern = 1.